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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/089.666 06/03/98 YAMAMOTO

Y 149733/97

EXAMINER

MMC1/0525

YOUNG & THOMPSON  
745 SOUTH 23RD STREET  
SUITE 200  
ARLINGTON VA 22202

APPOINT. J

PAPER NUMBER

DATE MAILED: 2812

05/25/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks



UNITED STATES DEPARTMENT OF COMMERCE  
Patent and Trademark Office

**NOTICE OF ALLOWANCE AND ISSUE FEE DUE**

MMC1/0525

YOUNG & THOMPSON  
745 SOUTH 23RD STREET  
SUITE 200  
ARLINGTON VA 22202

APPLICATION NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
09/089,666	06/03/98	021	HACK, J	2812 05/25/00
First Named Applicant	YAMAMOTO, 35 USC 154(b) term ext. = 0 Days.			

TITLE OF INVENTION **METHOD OF FABRICATING SEMICONDUCTOR DEVICE FOR PREVENTING RISING-UP OF SILISIDE**

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
0 149733/97	438-514	000	N06 UTILITY	NO	\$1210.00	08/25/00

**THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED.**

**THE ISSUE FEE MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED.**

**HOW TO RESPOND TO THIS NOTICE:**

I. Review the SMALL ENTITY status shown above.  
If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

- A. If the status is changed, pay twice the amount of the FEE DUE shown above and notify the Patent and Trademark Office of the change in status, or
- B. If the status is the same, pay the FEE DUE shown above.

If the SMALL ENTITY is shown as NO:

- A. Pay FEE DUE shown above, or
- B. File verified statement of Small Entity Status before, or with, payment of 1/2 the FEE DUE shown above.

II. Part B-Issue Fee Transmittal should be completed and returned to the Patent and Trademark Office (PTO) with your ISSUE FEE. Even if the ISSUE FEE has already been paid by charge to deposit account, Part B Issue Fee Transmittal should be completed and returned. If you are charging the ISSUE FEE to your deposit account, section "4b" of Part B-Issue Fee Transmittal should be completed and an extra copy of the form should be submitted.

III. All communications regarding this application must give application number and batch number.  
Please direct all communications prior to issuance to Box ISSUE FEE unless advised to the contrary.

**IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.**

PATENT AND TRADEMARK OFFICE COPY

# Notice of Allowability

Application No.

09/089,666

Examiner

Jonathan Hack

Applicant(s)

YAMAMOTO, YOSHIAKI

Art Unit

2812

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance and Issue Fee Due or other appropriate communication will be mailed in due course.

1. ☐ This communication is responsive to paper #8.
2. ☐ The allowed claim(s) is/are 21-41.
3. ☐ The drawings filed on 28 March 2000 are acceptable.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
  - a) ☒ All b) ☐ Some\* c) ☐ None of the CERTIFIED copies of the priority documents have been
    1. ☒ received.
    2. ☐ received in Application No. (Series Code / Serial Number). \_\_\_\_\_.
    3. ☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

5. ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. & 119(e).

A SHORTENED STATUTORY PERIOD FOR REPLY to comply with the requirements noted below is set to EXPIRE **THREE MONTHS** FROM THE "DATE MAILED" of this Office Action. Failure to timely comply will result in ABANDONMENT of this application. Extensions of time may be available under the provisions of 37 CFR 1.136(a).

6. ☐ Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient. A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.
7. ☐ Applicant MUST submit NEW FORMAL DRAWINGS
  - (a) ☐ because the originally filed drawings were declared by applicant to be informal.
  - (b) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review( PTO-948) attached
    - 1) ☐ hereto or 2) ☐ to Paper No. \_\_\_\_\_.
  - (c) ☐ including changes required by the proposed drawing correction filed \_\_\_\_\_, which has been approved by the examiner.
  - (d) ☐ including changes required by the attached Examiner's Amendment / Comment.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the reverse side of the drawings. The drawings should be filed as a separate paper with a transmittal letter addressed to the Official Draftsperson.

8. ☐ Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Any reply to this letter should include, in the upper right hand corner, the APPLICATION NUMBER (SERIES CODE / SERIAL NUMBER). If applicant has received a Notice of Allowance and Issue Fee Due, the ISSUE BATCH NUMBER and DATE of the NOTICE OF ALLOWANCE should also be included.

## Attachment(s)

- |  |   |
|--|---|
| 1 <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                             | 2 <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)          |
| 3 <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                    | 4 <input type="checkbox"/> Interview Summary (PTO-413), Paper No. _____.            |
| 5 <input type="checkbox"/> Information Disclosure Statements (PTO-1449), Paper No. _____.              | 6 <input type="checkbox"/> Examiner's Amendment/Comment                             |
| 7 <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit of Biological Material | 8 <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance |
|  | 9 <input type="checkbox"/> Other _____.   |

## DETAILED ACTION

### *Allowable Subject Matter*

1. Claims 21-41 are allowed.


The following is an examiner's statement of reasons for allowance: the prior art either singly or in combination fails to anticipate or render obvious the limitation heat treating to decrease a fluorine concentration to less than  $1 \times 10^{20}$  atoms/cm<sup>2</sup>, then forming a metal silicide layer. The prior art of Chiang et al US Patent 5,707,896 discloses a similar step of outgassing fluorine. Both the instant invention and Chiang et al implant BF<sub>2</sub> at similar energies, 30 KeV and 50-90 KeV respectively. Also, both implant similar dosages, 3 E15 and 1 E15 – 1 E16 respectively. Further, both outgass fluorine at similar temperatures, 700 C and 750-900 C respectively and for similar times 60 min and 20 to 60 min respectively. Chiang et al states that the “annealing is conducted at a temperature and time sufficient to outgas completely the fluorine atoms” (see column 5, lines 59-60). Chiang et al outgasses the fluorine to prevent delamination of an interlayer dielectric (ILD) layer resulting from voids formed from out-diffusion of the fluorine from a polysilicon surface during subsequent thermal processing in the presence of the ILD layer (see column 5, lines 40-48).

On the other hand, the instant invention outgasses fluorine to eliminate short circuits between the gate electrode and diffusion layers, and between diffusion layers due to the “rising up” reaction of a silicide formed during metallization (see paper #8, page 14). It is a close call as to whether or not the “rising up” reaction of a silicide would inherently be prevented from the process detailed by Chiang et al. All the process steps are essentially the same. In either case,


Art Unit: 2812

the outgassing is performed prior to the deposition of the ILD or the silicide layer. Because of this, there would be essentially no detrimental fluorine left that could form voids or that could cause the "rising up". However, as Chiang et al does not discuss the problem of "rising up" nor the solution as discovered by Applicant, the Examiner is marginally persuaded that it would not have been obvious to one of ordinary skill to recognize that the solution to the problem of "rising up" would have been solved by outgassing as described by Chiang et al. See, In re Robertson, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed Cir. 1999).

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."



Jonathan Hack  
Art Unit 2812  
May 24, 2000



John F. Niebling  
Supervisory Patent Examiner  
Technology Center 2800